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Study of element contents in bivalve molluscs: health benefit and risk

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Bivalve molluscs, which include mussels, oysters and clams, have high nutritional value. They are regarded as a good source for proteins, lipids, carbohydrates and minerals [1]. On the other hand, seafood may also contain harmful contaminants and other undesirable substances such as mercury and persistent halogenated compounds, which has resulted in a number of risk-benefit assessments during the last decade [2].

Four species of bivalve molluscs *Ruditapes philippinarum* (Manila clam, MC), *Yesso scallop* (YS), *Tegillarca granosa* (TG) and *Anadara broughtonii* (AB) were bought in two fish markets in Incheon, Korea, in order to determine content of As, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Se, Zn, and Fe and consequently, to estimate the health hazards associated to dietary intake. The samples were analyzed by inductively coupled plasma mass spectrometry (ICP-MS) after closed-vessel microwave digestion. The analytical accuracy of the method was evaluated by using the SRM (TORT-2, lobster hepatopancreas). Application of principal component analysis (PCA) and hierarchical cluster analysis (HCA) showed a tendency to form three groups between samples belonging to different genus of samples.

European food safety authority (EFSA) has established recommended daily intake (RDI) values for Cu, Fe, Mn and Zn of 3, 14, 5 and 10 mg/day, respectively. We calculated the RDI for daily consumption in milligrams per 300 g of sample. Our results showed that these species could serve as a good dietary source of essential elements, especially Fe, Mn and Zn. However, all species showed As content higher than the maximum tolerable limit specified by EFSA. Seafood is the major contributor to As in the diet though As in seafood mostly occurs as organic As species [3]. In addition, content of Mn in *Yesso scallop* is few times higher than in other species.

Table 1. Results found in bivalve molluscs species (mg/300 g, w.m.)

Elements	MC	AB	TG	YS
As	0.78 ± 0.09	0.42 ± 0.23	0.45 ± 0.15	0.31 ± 0.08
Cd	0.03 ± 0.01	0.15 ± 0.14	0.26 ± 0.16	0.34 ± 0.27
Co	0.05 ± 0.01	0.02 ± 0.01	0.02 ± 0.00	0.02 ± 0.01
Cr	0.02 ± 0.01	0.02 ± 0.01	0.03 ± 0.01	0.02 ± 0.01
Cu	0.23 ± 0.04	0.32 ± 0.19	0.36 ± 0.18	0.31 ± 0.27
Hg	0.02 ± 0.01	0.01 ± 0.00	0.02 ± 0.01	0.01 ± 0.01
Mn	0.40 ± 0.15	1.08 ± 0.70	1.12 ± 0.52	17.8 ± 17.5
Ni	0.17 ± 0.05	0.02 ± 0.01	0.04 ± 0.01	0.10 ± 0.11
Pb	0.01 ± 0.02	0.03 ± 0.02	0.04 ± 0.04	0.02 ± 0.01
Se	0.16 ± 0.03	0.10 ± 0.04	0.16 ± 0.04	0.12 ± 0.03
Zn	2.51 ± 0.29	3.53 ± 0.92	3.74 ± 0.79	9.15 ± 6.19
Fe	10.5 ± 6.6	16.7 ± 8.7	20.6 ± 6.9	4.4 ± 2.6

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